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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/800,366
Filing Date: March 06, 2001
Appellant(s): WOOD, ROLAND A.

____
Paul J. Urbanski (58351)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 14 September 2009 appealing from the Office action mailed 26 August 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

BPAI Appeal 2007-1983 (decided 19 September 2007)

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

A substantially correct copy of appealed claim 38 appears on page 21 of the Appendix to the appellant's brief. The minor errors are as follows: "he" on line 1 should probably be --The--.

(8) Evidence Relied Upon

5,129,595	THIEDE *et al.*	7-1992
5,258,619	DUVALL, III	11-1993
5,420,419	WOOD	5-1995
5,675,149	WOOD *et al.*	10-1997

Appellant's Admitted Prior Art (first paragraph on pg. 6 of the specification).

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 2, 7-12, 14-17, 20-25, 27, 29, and 33-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wood et al. (US 5,675,149) and incorporated by reference US Patent 5,420,419 (Wood) in view of Duvall, III (US 5,258,619).

The specification states (pg. 2, lines 6 and 7) that the " ... term "frame time" refers to a time in which a microbolometer array produces each complete picture or image of an object being viewed".

In regard to claim **1**, Wood *et al.* disclose a method for improving performance sensitivity and facility of operation of an array including microbolometers, comprising:

(a) applying N bias pulses substantially sequentially during a frame time (*i.e.*, the exposure time for producing a complete image; column 5, lines 47-53) to each microbolometer in the array, wherein N is 2 or greater;

(b) measuring N resulting signals corresponding to the N bias pulses (*i.e.*, multiple measurements; column 5, lines 47-53);

(c) computing an average signal value from the N resulting signals corresponding to each microbolometer in the array (*i.e.*, averaging of sensor signals; column 5, lines 47-53) during the frame time (*i.e.*, the exposure time); and

(d) producing an output signal based on the computed average signal value for each microbolometer in the array during the frame time (*i.e.*, the exposure time).

The method of Wood *et al.* lacks that the N bias pulses have a shorter time duration and frequency, selected such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time, wherein the time duration of each bias pulse is 1/N times that of a single pulse suitable for reading the array. Duvall, III teaches (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the bias pulse waveform parameters (*e.g.*, pulse duration is 1/N times that of a single pulse) in the method of Wood *et al.*, in order to meet a given detector and design situation so as to minimize unwanted detector heating (*e.g.*, a resulting temperature in each of the microbolometers is substantially uniform).

In regard to claim **2** which is dependent on claim 1, Wood *et al.* also disclose (column 1, lines 55-58) recording and displaying IR images. Inherent in the formation of

images is repeating the applying, measuring, computing, and producing steps to compute output signals during each frame time in order to form IR images.

In regard to claim **7** which is dependent on claim 1, Wood *et al.* also disclose (US 5,420,419 Fig. 6 and column 6, lines 18-34) that the bias pulses are substantially equal in magnitude.

In regard to claim **8** which is dependent on claim 1, the method of Wood *et al.* lacks that the bias pulses are substantially equally spaced in time. Duvall, III teaches (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the bias pulses waveform parameters (*e.g.*, pulses are substantially equally spaced in time) in the method of Wood *et al.*, in order to meet a given detector and design situation so as to minimize unwanted detector heating as taught by Duvall, III.

In regard to claim **9** which is dependent on claim 1, Wood *et al.* also disclose (US 5,420,419 Fig. 6 and column 2, lines 17-20) that the bias pulses comprise voltage bias pulses.

In regard to claim **10** which is dependent on claim 1, Wood *et al.* also disclose (US 5,420,419 column 7, lines 26-28) that the resulting signals comprise current signals.

In regard to claim **11** which is dependent on claim 1, Wood *et al.* also disclose (column 5, lines 47-53) that multiple measurements and averaging of sensor signals is equivalent to long exposures. Inherent in an average is at least two sensor signals each associated with an applied bias pulses and thus there are in the range of about 2 to 100 bias pulses dependent on the length of the exposure.

In regard to claim **12** which is dependent on claim 1, Wood *et al.* also disclose (US 5,420,419 Fig. 6 and column 6, lines 18-34) that the bias pulses have time duration in the range of about 0.1 to 20 microseconds (*e.g.*, 5-6 μs). The method of Wood *et al.* lacks that the temperatures varies less than one degree Celsius. Duvall, III teaches (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the bias pulse waveform parameters in the method of Wood *et al.*, in order to meet a given detector and design situation so as to minimize unwanted detector heating (*e.g.*, temperatures varies less than one degree Celsius).

In regard to claim **14**, Wood *et al.* disclose an infrared radiation detector apparatus comprising:

(a) microbolometers in an array (column 5, line 65 to column 6, line 1);

(b) a timing circuit coupled to the array to apply (US 5,420,419 column 6, lines 18-34) N bias pulses substantially sequentially to each microbolometer in the array during

a frame time (*i.e.*, the exposure time for producing a complete image; column 5, lines 47-53);

(c) a measuring circuit coupled to the array to measure N resulting signals associated with each of the applied N bias pulses (*i.e.*, multiple measurements; column 5, lines 47-53) during the frame time (*i.e.*, the exposure time);

(d) a computing circuit coupled to the measuring circuit to compute an average signal value (*i.e.*, averaging of sensor signals; column 5, lines 47-53) for each microbolometer in the array from the measured N resulting signals during the frame time (*i.e.*, the exposure time); and

(e) an output circuit coupled to the computing circuit to produce an output signal based on the computed average value for each microbolometer in the array during the frame time (*i.e.*, the exposure time) is inherent in displaying an image corresponding to the output signals.

The apparatus of Wood *et al.* lacks that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time. Duvall, III teaches (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the bias pulse waveform parameters (*e.g.*, pulse duration and duty cycle) in the apparatus of Wood *et al.*, in order to meet a given

detector and design situation (*e.g.*, the signal resulting from the rise in temperature caused by the N bias pulses is less than the signal resulting from incident infrared radiation) so as to minimize unwanted detector heating.

In regard to claim **15** which is dependent on claim 14, Wood *et al.* also disclose (column 2, lines 57-59) that the output circuit further comprises an integrator (integrating preamplifiers 26) and an A/D converter (32) wherein said output signal produced is a digital signal value for each microbolometer in the array.

In regard to claim **16** which is dependent on claim 15, Wood *et al.* also disclose (column 4, lines 5-24) a digital image processor (36), coupled to the output circuit to receive the digital signal value associated with each microbolometer in the array and correct the received digital signal value for image defects.

In regard to claim **17** which is dependent on claim 16, Wood *et al.* also disclose (column 4, lines 5-24) that the digital image processor (36) further comprises a correction circuit, to apply a corrective electrical signal based on a correction value to the output signal to correct for resistance non-uniformity in each microbolometer to obtain a substantially uniform output signal value.

In regard to claim **20** which is dependent on claim 14, Wood *et al.* also disclose (US 5,420,419 Fig. 6 and column 6, lines 18-34) that the bias pulses are substantially equal in magnitude.

In regard to claim **21** which is dependent on claim 20, the cited prior art is applied as in claim 8 above.

In regard to claim **22** which is dependent on claim 14, Wood *et al.* also disclose (US 5,420,419 Fig. 6 and column 2, lines 17-20) that the bias pulses comprise voltage bias pulses.

In regard to claim **23** which is dependent on claim 22, Wood *et al.* also disclose (US 5,420,419 column 7, lines 26-28) that the resulting signals comprise current signals.

In regard to claim **24** which is dependent on claim 14, Wood *et al.* also disclose (column 5, lines 47-53) that multiple measurements and averaging of sensor signals is equivalent to long exposures. Inherent in an average is at least two sensor signals each associated with an applied bias pulses and thus there are in the range of about 2 to 100 bias pulses dependent on the length of the exposure.

In regard to claim **25** which is dependent on claim 24, Wood *et al.* also disclose (US 5,420,419 Fig. 6 and column 6, lines 18-34) that the bias pulses have time duration in the range of about 0.1 to 20 microseconds (*e.g.*, 5-6 μs).

In regard to claim **27**, the cited prior art is applied as in claims 1, 12, and 14 above.

In regard to claim **29** which is dependent on claim 27, the cited prior art is applied as in claim 15 above.

In regard to claim **33** which is dependent on claim 27, the cited prior art is applied as in claim 20 above.

In regard to claim **34** which is dependent on claim 27, the cited prior art is applied as in claim 21 above.

In regard to claims **35** and **36** which are dependent on claim 27, the cited prior art is applied as in claims 22 and 23 above.

In regard to claims **37** and **38** which are dependent on claim 27, the cited prior art is applied as in claims 24 and 25 above.

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wood et al. and incorporated by reference US Patent 5,420,419 in view of Duvall, III as applied to claim 2 above, and further in view of Appellant Admitted Prior Art.

In regard to claim **3** which is dependent on claim 2, the modified method of Wood *et al.* lacks applying a corrective electrical signal to the output signal to correct for resistance non-uniformity between the microbolometers of the array to obtain a substantially uniform output signal value. Appellant admits (first paragraph on pg. 6) it is known in the art (such as US Patent 4,752,694) to apply a corrective electrical signal to the output signal to correct for resistance non-uniformity between the one or more microbolometers of the array (*i.e.*, "coarse non-uniformity correction") to obtain a substantially uniform output signal value. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to apply a corrective electrical signal in the modified method of Wood *et al.*, in order to obtain a substantially uniform output signal value.

In regard to claim **4** which is dependent on claim 3, Wood *et al.* also disclose (column 2, lines 57-59) an integrator (integrating preamplifiers 26) and an A/D converter (32) to converting the substantially uniform output signal associated with each microbolometer to a digital signal value.

In regard to claim **5** which is dependent on claim 4, Wood *et al.* also disclose (column 4, lines 5-24) passing the digital signal values associated with each microbolometer in the array through a digital image processor to correct for image defects.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wood et al. and incorporated by reference US Patent 5,420,419 and Duvall, III in view of Appellant Admitted Prior Art as applied to claim 5 above, and further in view of Thiede et al. (US 5,129,595).

In regard to claim **6** which is dependent on claim 5, the modified method of Wood *et al.* lacks that the image defects comprise fine offsets, gain non-uniformity, and dead pixels. Image defects such as fine offsets, gain non-uniformity, and dead pixels are well known in the art. For example, Thiede *et al.* teach (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to correct for gain non-uniformity and dead pixels in the modified method of Wood *et al.*, in order to fully compensate for array non-uniformity.

Claims 18, 19, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wood et al. and incorporated by reference US Patent 5,420,419 in view of Duvall, III as applied to claims 17 and 29 above, and further in view of Thiede et al. (US 5,129,595).

In regard to claim **18** which is dependent on claim 17, the cited prior art is applied as in claim 6 above.

In regard to claim **19** which is dependent on claim 18, Wood *et al.* also disclose (column 4, lines 5-24) that the digital image processor (36) further comprises digital memories to store the correction values for each microbolometer in the array.

In regard to claim **30** which is dependent on claim 29, the cited prior art is applied as in claim 6 above.

In regard to claim **31** which is dependent on claim 30, the cited prior art is applied as in claims 16 and 17 above.

In regard to claim **32** which is dependent on claim 31, the cited prior art is applied as in claim 19 above.

(10) Response to Argument

Cited Prior Art

In regard to the cited prior art (WOOD *et al.* and incorporated by reference US Patent 5,420,419), the 19 September 2007 BPAI decision states (pg. 5) that:

> … We agree with the Examiner that the multiple measurements and averaging of the sensitivity improvement feature of Wood '149, coupled with the incorporated teachings of Wood '419 of applying a single bias pulse to produce an image, at least implicitly discloses applying multiple bias pulses substantially sequentially during a frame time for each microbolometer as claimed. …

In regard to the cited prior art (DUVALL, III), the 19 September 2007 BPAI decision states (pg. 14) that:

> … In view of Duvall's teaching, we conclude that the skilled artisan would have ample suggestion to adjust the frequency and width of the bias pulses in the arrangement of Wood references to more readily control heating of the detectors, including heating in a more uniform manner. …

Arguments on pg. 11-14 in the Appeal Brief filed 14 September 2009

Appellant argues that the rejections of the claims should be withdrawn since the Final Office Action is apparently equating the slider mechanism of Wood *et al.* with applying N bias pulses substantially sequentially during a time frame and the slider mechanism of Wood *et al.* has nothing to do with bias pulses at all. Examiner respectfully disagrees. Wood *et al.* state (column 5, lines 47-53) that "If desired, slower slide velocities, or multiple scans of any desired region of the scene, can be employed to allow sensitivity improvement by multiple measurement and averaging of sensor signals: in this case, a stable platform for example, a tripod mounting of the camera may be required, analogous to long exposures of visible photographic still frame cameras". The key phrase is "multiple measurement and averaging of sensor signals". Thus, Wood *et al.* disclose obtaining sensor signal averages of multiple measurements so as to produce a complete picture or image within the exposure (*i.e.*, frame) time. It should be noted that this is different than averaging of complete images. Averaging of complete images is described by Wood *et al.* at lines 11-16 of column 5 wherein it is stated that "If desired, successive images may also be averaged, to produce an image of the scene with enhanced sensitivity, allowing the exact position of any moving or temperature-changing object to be readily determined by reference to the stationary objects in the scene". Thus it is clear that obtaining sensor signal averages of multiple measurements so as to produce a

complete image within the exposure (*i.e.*, frame) time is different than averaging of complete images. Further, incorporated by reference Wood states (column 2, lines 51-53) that “The passive elements of the focal plane array in the package 10 need to be polled or interrogated by providing a voltage or a current” and (column 6, lines 18-20) that “In FIG. 6 the voltage level indicated by line 5 is that of the pulse biased current supplied to a single microbolometer in a focal plane array over time”. Thus, incorporated by reference Wood discloses that a single measurement is obtained by applying a single pulse biased current to a single microbolometer in a focal plane array. Therefore, the multiple measurements of Wood *et al.* necessarily imply applying a sequence of pulse biased current to a single microbolometer in a focal plane array. That is, “multiple measurement and averaging of sensor signals” necessarily implies applying two or more bias pulses substantially sequentially to each microbolometers in the array so as to obtain two or more measurements (corresponding to the two or more bias pulses) from each microbolometers in the array for averaging of the two or more measurements to obtain a complete image. Therefore, Wood *et al.* teach or suggest applying N bias pulses substantially sequentially during a time frame to obtain a complete image.

Appellant argues that Duvall, III does not teach or suggest applying N bias pulses substantially sequentially during a flame time to each microbolometer in the array, wherein N is 2 or greater, and wherein the N bias pulses have a shorter time duration and frequency, selected such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time, wherein the time duration of each bias pulse is 1/N times

that of a single pulse suitable for reading the array. In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, Wood *et al.* teach or suggest applying N bias pulses substantially sequentially during a time frame to obtain a complete image. Duvall, III teaches (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the bias pulse waveform parameters (*e.g.*, pulse duration and duty cycle) for the N bias pulses during a frame time in the apparatus of Wood *et al.*, in order to meet a given detector and design situation (*e.g.*, the signal resulting from the rise in temperature caused by the N bias pulses is less than the signal resulting from incident infrared radiation) so as to minimize unwanted detector heating.

Appellant argues that since independent claim 14 recites "a timing circuit coupled to the array to apply N bias pulses substantially sequentially to each microbolometer in the array during a frame time such that a resulting temperature in each of the microbolometers in the array due to such applying of N bias pulses is substantially uniform during the frame time", a *prima facie* case of obviousness has not been established for independent claim 14 and claims dependent thereon either. Examiner respectfully disagrees for the reasons discussed above.

Appellant argues that the cited portion of Duvall, III mentions nothing about a temperature variation of less than one degree Celsius. In response to appellant's argument, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Duvall, III teaches (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation, in order to minimize unwanted detector heating. Minimizing detector heating due to bias results in minimal change in detector temperature and thus the detector is at the substantially uniform initial temperature. Therefore it would have been obvious to one having ordinary skill in the art to adjust the bias pulses waveform parameters in the infrared radiation detector apparatus and method of Wood *et al.*, in order to meet a given detector and design situation so as to minimize unwanted detector heating resulting substantially uniform temperature (*e.g.*, detector temperature variation of less than one degree Celsius) as taught by Duvall, III.

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner’s answer are provided herein.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/David P. Porta/

Supervisory Patent Examiner, Art Unit 2884

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